Soil and Soil Management.

(1) *Agricultural Geology.* By Dr. F. V. Emerson. Pp. xviii + 319. (New York: John Wiley and Sons, Inc.; London: Chapman and Hall, Ltd., 1920.) 16*s.* 6*d.* net.

(2) *The Soils and Agriculture of the Southern States.* By H. H. Bennett. Pp. xviii + 399 + plates. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd., 1921.) 18*s.* net.

(3) *Productive Soils: The Fundamentals of Successful Soil Management and Profitable Crop Production.* By W. W. Weir. (Lippincott's Farm Manuals.) Pp. xvi + 398. (Philadelphia and London: J. B. Lippincott Co., 1920.) 10*s.* 6*d.* net.

(4) *Soil Alkali: Its Origin, Nature and Treatment.* By Prof. F. S. Harris. (Wiley Agricultural Series.) Pp. xvi + 258. (New York: John Wiley and Sons, Inc.; London: Chapman and Hall, Ltd., 1920.) 13*s.* 6*d.* net.

(5) *Text-book of Land Drainage.* By J. A. Jeffery. (The Rural Text-book Series.) Pp. xx + 256. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd., 1921.) 10*s.* 6*d.* net.

(6) *Agriculture and Irrigation in Continental and Tropical Climates.* By K. D. Doyle. Pp. xv + 268. (London: Constable and Co., Ltd., 1921.) 19*s.* net.

THE output of books on the soil is now considerable, especially in the United States, and it is gratifying to find that the number of agricultural students is so large as to justify an array of volumes such as now exists.

(1) Prof. Emerson deals with the subject fundamental to a large part of the work—the geological processes by which the mineral particles of the soil came to have their present properties, composition, and position. It is no longer supposed that the study of soil is simply a branch of geology, because the vital part played by biological factors is fully recognised. Nevertheless the fact remains that geological factors determine the whole structure of the soil, on which its agricultural value largely depends.

The book deals exclusively with United States conditions, but it is of more than local interest. The method of handling the subject may be commended to teachers in this country who have no book on similar lines dealing with Great Britain. In particular the illustrations and the models are distinctly helpful in character.

Good use is made of the material collected by the U.S. Soil and Geological Surveys, and there are sketch maps to show the broad outlines of the soil regions and the main types of soil. One of the most important soil regions is the coastal plain, extending from New Jersey through Texas and on to the south, which consists mainly of sands or light loams. West and north of this region is the Piedmont Plateau, the soils of which are in the main rather heavy. A third highly important group contains the glacial and loessial soils, which include much of the wheat and corn belt.

In addition to the account of soils there is a useful survey of the phosphate deposits of the States. It is not generally realised that the United States is by far the leading producer of rock phosphate, and claims to be able to maintain this position in virtue of its enormous untouched reserves. Tennessee and Florida are the most important sources.

Altogether the book is one which cannot fail to interest the teacher in this country, while the serious agricultural student will welcome it as a concise statement of the origin of the soils of the United States and will wish he knew of as good an account of British soils.

(2) Dr. Bennett starts where Prof. Emerson leaves off, and, assuming the soils already formed, proceeds to describe them in detail and to show what agricultural systems have grown up on them. As an illustration: the coastal plains soil mentioned above is here subdivided into eighteen divisions, of which by far the largest is the Norfolk soil. General farming predominates over the whole area, the particular crops being determined by the climate, which varies from subtropical to moderate conditions not far removed from our own. The main crops, however, are cotton, maize, and tobacco; about 70 per cent. of the United States cotton is produced on these soils. There are also many specialised areas and instances of crops or products which, at first subsidiary, have gradually assumed more and more importance, until finally they dominate a district or formation. The data are well collected, and there are many tables of statistics, both in the main part of the book and in the appendix, which the reader will not easily find elsewhere. There are numerous illustrations of normal agricultural practices and novel features which possess sufficient interest to justify special description.

We know of no better account of the soil and agriculture of the Southern States, and, as in the case of Prof. Emerson's work, the British teacher will certainly wish he had as good an account of the uses to which British soils are put.

(3) Prof. Weir's book deals with the subject of

soil generally, not with the soils of a particular region. It is written for the practical agriculturist and for the student who wishes to farm rather than for the man who desires to become a soil expert, and the illustrations and the tables are of such a kind as will appeal at once to the man interested in the business aspects of the subject. Take, for instance, Table I., which summarises a long and complex series of experiments in Ohio, or the comparison between grain-farming with and without livestock respectively shown in Table II.

TABLE I.—*Effect of Liming an Acid Soil.*

Treatment (once in 5 years).	Average value of crops per acre per rotation.		Average cost of lime and fertiliser per acre per rotation.		Net gain per acre per rotation.	
	Unlimed. Dollars.	Limed. Dollars.	Unlimed. Dollars.	Limed. Dollars.	Unlimed. Dollars.	Limed. Dollars.
No manure, no fertiliser	49.40	61.40	—	5.00	—	7.00
Manure (8 tons per acre)	78.58	94.49	16.00	21.00	14.96	25.87
Acid phosphate (320 lb. per acre)	67.80	81.80	2.60	7.60	15.20	24 20
Complete fertiliser	87.76	104.49	17.60	22.60	23.46	35.09

TABLE II.—*Grain-farming* v. *Stock-farming in maintaining Soil Fertility.*

Crops.	Average yields per acre in grain-farming.		Average yields per acre in stock-farming.	
	Grain or seed.	Hay, stover, or straw.	Grain or seed.	Hay, stover, or straw.
	Bushels.	Tons.	Bushels.	Tons.
Corn ...	58·6	None harvested	64·6	1·55
Soybeans	19·0	0·87	21·9	1·00
Wheat ...	28·7	1·32	32·4	1·55
Clover ...	Not gathered			2·23

It would be difficult to find terser and clearer illustrations of the important part played by lime and livestock as adjuncts to good farming.

There is an excellent section on ploughs and other implements, and an interesting example of a fraudulent use of soil analysis of a kind we have not met with in this country. We should not agree with the author's unqualified statement of the Law of Diminishing Returns as applied to fertilisers; recent experiments in this country indicate that the return increases at first in a greater proportion than the amount of fertiliser used; not until a certain excess is reached does the return begin to diminish.

(4) Dr. Harris's book is entirely specialised, and deals with one aspect of soil only, viz. alkali, a sufficiently important subject, however, to occupy one man's whole time and attention. He speaks with great authority; as the Director of the Utah Agricultural Experiment Station he has had unrivalled opportunities for studying the problem at first hand. By alkali is meant any soluble salt that makes the soil solution sufficiently concentrated to injure the plant; the salts include the chlorides, sulphates, carbonates, and nitrates of sodium, potassium, and magnesium, and the chloride and nitrate of calcium. In the author's view these salts arise from desiccated inland seas. Most of them are actually neutral, but the word "alkali" has so long held the field that it is not likely to be displaced. Some idea of the magnitude of the problem is conveyed by the statement that more than 9,000,000 acres (or 13 per cent.) of the irrigated land of the United States suffer from this cause. While the author devotes his attention largely to practical problems he is quite alive to the scientific interest of the matter, and he gives numerous references which will allow the student to proceed further in the inquiry.

There are useful lists of indicator plants and descriptions of some of the most typical of them. Certain of the Atriplex species are the last to abandon an alkali flat. Various methods are described by which the ill effects can be mitigated, but the only permanent cure is flooding, which, however, must be accompanied by adequate drainage or it soon makes matters worse.

(5) Prof. Jeffery, who was for long in charge of the Soil Department of the Michigan Agricultural College, and has now become Land Commissioner for one of the important States railways, has published the book on drainage for which he was known to possess considerable material. It is intended for the student, and presents the subject in a very comprehensive form. Some of the experimental demonstrations are ingenious, and many of the data will prove of interest to the teacher. In the United States, as in England, the level of the wells is falling, though usually only slightly, the minimum lowering per decade for the entire country being 0·68 ft. for dug wells and 2·17 ft. for drilled wells; the maximum recorded is 4·66 ft. for the decade. The book contains some interesting illustrations of actual drainage problems which cannot fail to help the student.

(6) Mr. Doyle's book deals with the specialised subject of irrigation in its wider aspects and regarded as the basis of prosperous farming. "The most certain road to profitable production is by permanent irrigation with good drainage, in an equable climate, free from frost. Under these circumstances much of the uncertainty of farming is eliminated and the best conditions of

growth can be secured as if in a laboratory." This thesis is developed at length, and the author does not confine himself to any one country, but ranges over much of the British Empire. The book will be found to help the agricultural student who wishes to farm in the Empire, but is not certain where to go or what sort of problems will confront him when he begins.

E. J. RUSSELL.

History and Method of Science.

Studies in the History and Method of Science. Edited by Dr. Charles Singer. Vol. 2, Pp. xxii+559+55 plates. (Oxford: At the Clarendon Press, 1921.) 48*s.* net.

IN recent years there has been a great development in the study of history as applied to science, and apart from special journals and magazines dealing generally with the history of science, there is a constant accession to scientific literature of historical treatises, essays, and biographies. The present volume is the second of a series the aim of which is to help the student to a conception of the true place of scientific discovery in the history of human thought, and by a series of special papers to show the lines along which the accumulated mass of scientific knowledge has evolved.

The scope is wide, for the volume deals with such diverse subjects as hypothesis, science and metaphysics, Aristotle and the heart, medieval astronomy, the scientific works of Galileo, Leonardo as an anatomist, Greek biology and its relation to the rise of modern biology, etc. Whether it is expedient to collect in one volume subjects differing so widely in nature may be open to argument. At the same time, so far as we can judge, all the articles are of high merit, and many of them represent the work of years or even a lifetime. There must be few people whose minds are so constituted or whose knowledge and interests are so great that they can turn from reading "Four Armenian Tracts on the Structure of the Human Body" to read with relish or profit the learned article on "Archimedes' Principle of the Balance and some Criticisms upon it"; but the object of the editor was no doubt one of instruction and an attempt to keep open the wider channels of science which are daily liable to silt up through the contracting power of extreme specialism.

Mindful of these difficulties, it would therefore be invidious to criticise each article. As the bulk of the volume applies to history in the natural sciences, it will appeal most strongly to biologists, and in this connection we may direct attention to the interesting article by E. T. Withington, "The Asclepiadæ and the Priests of Asclepius"; that by the Norwegian, H. Hopstock, on "Leonardo as Anatomist"; and the very exact and accurate article by F. J. Cole on "The History of Anatomical Injections." The editor, Dr. Singer, contributes the longest article in the book, entitled "Greek Biology and its Relation to the Rise of Modern Biology," amply, and indeed expensively, illustrated.

Altogether, the book is a credit to all those who have co-operated in its production, and considering its get-up as well as the price of everything connected with printing at the present time, its cost must be regarded as very reasonable, if not actually cheap.

W. B.

Our Bookshelf.

The Chemists' Year Book, 1921. Edited by F. W. Atack, assisted by L. Whinyates. Vol. 1, pp. vi+422; vol. 2, pp. vii–viii+423–1142. (Manchester: Sherratt and Hughes, 1921.)

THE new edition of "The Chemists' Year Book" has been revised in the sections on fuels and illuminants, crystallography, and cellulose, while the section on coal-tar has been completely rewritten. There are some inaccuracies to be noticed in the section on "Notable Dates in the History of Chemistry," but the numerical data appear to have been edited carefully in accordance with recent work. The section on acid and alkali manufacture is too brief to be of much value, though in some cases in which the book has been tested it has shown itself superior to other more ambitious works. The exact meaning of "percentage" in density tables, for instance, is given in cases where other compilations are quite ambiguous.

Pure Thought and the Riddle of the Universe. By F. Sedlák. Vol. 1, *Creation of Heaven and Earth.* Pp. xv+375. (London: George Allen and Unwin, Ltd., n.d.) 18*s.* net.

THE aim of this book is praiseworthy in the highest degree. Unfortunately it cannot be said to achieve success. The author tells us that he has already published a translation of the first two volumes of Hegel's "Wissenschaft der Logik," but it had failed to arouse interest. He has therefore conceived the idea, not of paraphrasing it literally, but of presenting what he considers and accepts as its essential meaning in his own words. Where he seems to us to fail is in not understanding that Hegel, so far as he makes appeal to present students, does so in the spirit of his thought and not in the now antiquated form of its expression.